

CLAIMS

What is claimed is:

1. A multi-format adaptive plesiochronous network, comprising:
 - a first router;
 - a topology adaptive tie-line having a plurality of full duplex dedicated router interconnects connected to said first router;
- 5 a second router connected to said plurality of full duplex dedicated router interconnects;
 - a first user connected to said first router with a first full duplex loop; and
 - a second user connected to said second router with a second full duplex loop.
2. The multi-format adaptive plesiochronous network of claim 1, wherein each of said plurality of full duplex dedicated router interconnects is selected from the group consisting of a single full duplex wave division multiplexer optical fiber, a pair of simplex optical fibers, a single full duplex frequency division multiplexer electrical wire, and a pair of simplex electrical wires.
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3. The multi-format adaptive plesiochronous network of claim 1, wherein each of said plurality of full duplex dedicated router interconnects are selected from the group consisting of a looping, point-to-point connection, and a parallel ring connection.

4. The multi-format adaptive plesiochronous network of claim 1, wherein said plurality of full duplex dedicated router interconnects includes a reconfigurable full duplex point-to-point connection which is adapted for passing control network data from said first user to said second user.

5. The multi-format adaptive plesiochronous network of claim 1, wherein said plurality of full duplex dedicated router interconnects includes a permanent full duplex looping point to point connection which is adapted for passing control network data from said first user to said second user.

6. The multi-format adaptive plesiochronous network of claim 1, wherein both said first user and said second user include:

- I) a signal transmitting system for transmittal of a serialized signal including (A) latency free continuous data, and (B) at least one member selected from the group consisting of bursty data and packetized data, said signal transmitting system including a multiplexer and a timing control block; and
- II) a signal receiving system for reception of said signal without disrupting the laminarity of the latency free continuous data, said signal receiving system including a demultiplexer and a sequence detector,

10 so as to establish full duplex communications between said first user and said second user on one of said plurality of full duplex dedicated router interconnects.

7. The multi-format adaptive plesiochronous network of claim 6, wherein said multiplexer includes a structure which simultaneously transfers of base band latency free continuous real-time multimedia data.

8. The multi-format adaptive plesiochronous network of claim 6, wherein said multiplexer includes a time division multiplexer and at least one of said plurality of full duplex dedicated router interconnects is selected from the group consisting of a single full duplex wave division multiplexer optical fiber and a pair of simplex optical fibers.

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9. The multi-format adaptive plesiochronous network of claim 4, wherein said multiplexer includes a multiplexer network access port which is adapted for simultaneous (I) full duplex messaging between said first user and said second user and (II) management of said network including dynamic reallocation of network resources, said multiplexer network access port being selected from the group consisting of structure for asynchronous data communication and structure for packetized data communication.

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10. The multi-format adaptive plesiochronous network of claim 9, wherein said multiplexer network access port is selected from the group consisting of an RS232

with full hand shake port, an RS422 port, an RS485 port, a SCSI port and a full duplex 10Mb/sec packetized data port.

11. The multi-format adaptive plesiochronous network of claim 4, wherein (I) said multiplexer includes a clock multiplier, an encoder, a framer and a parallel to serial convertor, and (II) both said first user and said second user include an analog-to digital converter, a first-in-first-out memory buffer having an almost empty flag, a 5 digital to analog convertor, a counter register and a latch.

12. The multi-format adaptive plesiochronous network of claim 1, wherein both said first user and said second user include a switch for dropping and adding signals.

13. The multi-format adaptive plesiochronous network of claim 1, wherein both said first user and said second user include a 1:2 bypass switch for redundant switching.

14. The multi-format adaptive plesiochronous network of claim 1, wherein there are n users, N lines, where $N < n$, and the system is quasi-latency free such that there is no contention at least part of the time.

15. A method of operating a multi-format adaptive plesiochronous network comprising:

providing a plurality of switches, each of said plurality of switches including a physical layer router;

connecting a first user to a first of said plurality of switches;

5 interconnecting said plurality of switches into a multi media digital switched network; and

sending control data from said first user to configure a first of said plurality of switches to define a first mode selected from the group consisting of star, trunk, ring, drop-add, broadcast, conferencing and monitor.

16. The method of operating a multi-format adaptive plesiochronous network according to claim 15, further comprising sending control data from said first user to configure a second of said plurality of switches to define a second mode selected from the group consisting of star, trunk, ring, drop-add, broadcast, conferencing and 5 monitor.

17. The method of operating a multi-format adaptive plesiochronous network according to claim 16, wherein said first mode and said second mode are simultaneously configured.

18. The method of operating a multi-format adaptive plesiochronous network according to claim 15, further comprising connecting a second user to a second of

5 said plurality of switches and sending control data from said second user to configure said second of said plurality of switches to define a second mode selected from the group consisting of star, trunk, ring, drop-add, broadcast, conferencing and monitor.

19. The method of operating a multi-format adaptive plesiochronous network according to claim 18, wherein said first mode and said second mode are simultaneously configured.

20. A method of hybrid in-band simultaneous out-band control, comprising:
providing a multi-format adaptive plesiochronous network; and
using at least one method selected from the group consisting of drop-add of control data stream through the entire network and drop-insert of control data stream
5 through the entire network.

21. A multi-format adaptive plesiochronous network, comprising an add/drop multiplexer, said add/drop multiplexer including:

I) a signal transmitting system for simultaneous transmittal, on a first single tie line, of latency free continuous data and at least one member selected from the group consisting of bursty data and packetized data, said signal transmitting system including
A) a time division multiplexer, B) an analog-to-digital convertor for simultaneous transmittal of base band latency free continuous real time audio and video data

connected to said time division multiplexer, C) a timing control block connected to said time division multiplexer, D) a first FIFO memory buffer connected to both said time division multiplexer and said timing control block and E) a clock multiplier connected to said multiplexer;

II) a signal receiving system for simultaneous reception, on a second tie line, of latency free continuous data and at least one member selected from the group consisting of bursty data and packetized data, said signal receiving system including A) a time division demultiplexer, B) a digital-to-analog convertor for simultaneous reception of base band latency free continuous real time audio and video data connected to said time division demultiplexer, C) a state machine connected to said demultiplexer, and D) a second FIFO memory buffer connected to both said demultiplexer and said state machine;

III) a switch for dropping and adding signals connected to both said multiplexer and said demultiplexer; and

IV) a network access port for simultaneous I) full duplex messaging between a first user and a second user and II) management of a network including dynamic reallocation of network resources, said network access port being connected to said switch for dropping and adding signals,

wherein said network access port includes at least one subport selected from the group consisting of an RS232 subport with a full hand shake interface, an RS422

subport, an RS485 subport, a SCSI subport and a full duplex 10Mb/sec packetized data subport.

22. A multi-format adaptive plesiochronous network, comprising:

I) a signal transmitting system for transmittal of a serialized signal including A) latency free continuous data and B) at least one member selected from the group consisting of bursty data and packetized data, said signal transmitting system including a multiplexer and a timing control block, and

II) a signal receiving system for reception of said signal without disrupting the laminarity of the latency free continuous data, said signal receiving system including a demultiplexer and a sequence detector.

23. The multi-format adaptive plesiochronous network of claim 22, wherein said multiplexer includes a time division multiplexer, said signal transmitting system includes an analog-to-digital convertor for simultaneous transmittal of base band latency free continuous real time audio and video data, said demultiplexer includes a time division demultiplexer and said signal receiving system includes a digital-to-analog convertor for simultaneous reception of base band latency free continuous real time audio and video data.

24. The multi-format adaptive plesiochronous network of claim 22, further comprising a full duplex dedicated router interconnect connected to both said signal transmitting system and said signal receiving system, said full duplex dedicated router interconnect being selected from the group consisting of a single full duplex wave division multiplexer optical fiber and a pair of simplex optical fibers.

25. The multi-format adaptive plesiochronous network of claim 22, further comprising a network access port for simultaneous I) full duplex messaging between a first user and a second user and II) management of a network including dynamic reallocation of network resources, ~~said network access port being connected to both said multiplexer and said demultiplexer.~~

26. The multi-format adaptive plesiochronous network of claim 25, wherein said network access port includes at least one subport selected from the group consisting of an RS232 subport with full hand shake support, an RS422 subport, an RS485 subport, a SCSI subport and a full duplex 10Mb/sec packetized data subport.

27. The multi-format adaptive plesiochronous network of claim 25, wherein said network access port includes a subport for asynchronous data communication.

28. The multi-format adaptive plesiochronous network of claim 22, wherein:

A) said signal transmitting system includes 1) a timing control block connected to said multiplexer, 2) a first FIFO memory buffer having an almost empty flag, said first FIFO being connected to both said multiplexer and said timing control block, 3) a clock multiplier connected to said multiplexer and 4) an analog-to-digital convertor connected to said multiplexer; and

B) said signal receiving system includes 1) a state machine connected to said demultiplexer, 2) a second FIFO memory buffer connected to both said demultiplexer and said state machine and 3) a digital-to-analog convertor connected to said demultiplexer.

29. The multi-format adaptive plesiochronous network of claim 22, further comprising a switch for dropping and adding signals connected to at least one of said multiplexer and said demultiplexer.

30. The multi-format adaptive plesiochronous network of claim 29, further comprising a network access port for simultaneous I) full duplex messaging between a first user and a second user and II) management of a network including dynamic reallocation of network resources, said network access port being connected to said switch for dropping and adding signals.

31. The multi-format adaptive plesiochronous network of claim 30, wherein said network access port includes at least one subport selected from the group consisting of an RS232 subport with full hand shake support, an RS422 subport, an RS485 subport, a SCSI subport and a full duplex 10Mb/sec packetized data subport.

32. The multi-format adaptive plesiochronous network of claim 30, wherein said network access port includes a subport for asynchronous data communication.

33. The multi-format adaptive plesiochronous network of claim 32, further comprising a 2:1 bypass switch for ~~redundant switching~~, said 2:1 bypass switch being coupled to said demultiplexer.

34. The multi-format adaptive plesiochronous network of claim 33, further comprising a wavelength division multiplexer coupled to said time division multiplexer and a wavelength division demultiplexer coupled to said time division demultiplexer.

35. A method of operating a multi-format adaptive plesiochronous network, comprising:

I) transmitting a serialized signal including A) latency free continuous data and B) at least one member selected from the group consisting of bursty data and

packetized data on a single tie line using said signal transmitting system, wherein transmitting includes encoding a clock; and

II) receiving said serialized signal from said single tie line using said signal receiving system, wherein receiving includes recovering said clock with a sequence detector.

36. The method of operating a multi-format adaptive plesiochronous network according to claim 35, wherein the step of providing includes providing a drop-add switch for dropping and adding signals, said drop-add switch being connected to both said multiplexer and said demultiplexer and, further comprising, reconfiguring said drop-add switch using data from said signal.

37. An apparatus, comprising a network, said network including:
a first router;
a tie-line having a plurality of full duplex dedicated router interconnects connected to said first router;
a second router connected to said plurality of full duplex dedicated router interconnects;
a first user connected to said first router with a first full duplex loop; and
a second user connected to said second router with a second full duplex loop.

38. The apparatus of claim 37, wherein each of said plurality of full duplex dedicated router interconnects is selected from the group consisting of a single full duplex wave division multiplexer optical fiber, a pair of simplex optical fibers, a single full duplex frequency division multiplexer electrical wire, and a pair of simplex electrical wires.

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39. The apparatus of claim 37, wherein each of said plurality of full duplex dedicated router interconnects are selected from the group consisting of a looping, point-to-point connection, and a parallel ring connection.

40. The apparatus of claim 37, wherein said plurality of full duplex dedicated router interconnects includes a reconfigurable full duplex point-to-point connection which is adapted for passing control network data from said first user to said second user.

41. The apparatus of claim 37, wherein said plurality of full duplex dedicated router interconnects includes a permanent full duplex looping point to point connection which is adapted for passing control network data from said first user to said second user.

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42. The apparatus of claim 37, wherein both said first user and said second user include:

- I) a signal transmitting system for transmittal of a serialized signal including (A) latency free continuous data, and (B) at least one member selected from the group consisting of bursty data and packetized data, said signal transmitting system including a multiplexer and a timing control block; and
- II) a signal receiving system for reception of said signal without disrupting the laminarity of the latency free continuous data, said signal receiving system including a demultiplexer and a sequence detector,

10 so as to establish full duplex ~~communications~~ between said first user and said second user on one of said plurality of full duplex dedicated router interconnects.

43. The apparatus of claim 42, wherein said multiplexer includes a structure which simultaneously transfers of base band latency free continuous real-time multimedia data.

44. The apparatus of claim 42, wherein said multiplexer includes a time division multiplexer and at least one of said plurality of full duplex dedicated router interconnects is selected from the group consisting of a single full duplex wave division multiplexer optical fiber and a pair of simplex optical fibers.

45. The apparatus of claim 40, wherein said multiplexer includes a multiplexer network access port which is adapted for simultaneous (I) full duplex messaging between said first user and said second user and (II) management of said network including dynamic reallocation of network resources, said multiplexer network access port being selected from the group consisting of structure for asynchronous data communication and structure for packetized data communication.

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46. The apparatus of claim 45, wherein said multiplexer network access port is selected from the group consisting of an RS232 with full hand shake port, an RS422 port, an RS485 port, a SCSI port and a full duplex 10Mb/sec packetized data port.

47. The apparatus of claim 40, wherein (I) said multiplexer includes a clock multiplier, an encoder, a framer and a parallel to serial convertor, and (II) both said first user and said second user include an analog-to digital converter, a first-in-first-out memory buffer having an almost empty flag, a digital to analog convertor, a counter register and a latch.

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48. The apparatus of claim 37, wherein both said first user and said second user include a switch for dropping and adding signals.

49. The apparatus of claim 37, wherein both said first user and said second user include a 1:2 bypass switch for redundant switching.

50. The apparatus of claim 37, wherein there are n users, N lines, where $N < n$, and the system is quasi-latency free such that there is no contention at least part of the time.

51. A method comprising:

providing a plurality of switches, each of said plurality of switches including a physical layer router;

connecting a first user to a first of said plurality of switches;

interconnecting said plurality of switches into a multi media digital switched network; and

sending control data from said first user to configure a first of said plurality of switches to define a first mode selected from the group consisting of star, trunk, ring, drop-add, broadcast, conferencing and monitor.

52. The method of claim 51, further comprising sending control data from said first user to configure a second of said plurality of switches to define a second mode selected from the group consisting of star, trunk, ring, drop-add, broadcast, conferencing and monitor.

53. The method of claim 52, wherein said first mode and said second mode are simultaneously configured.

54. The method of claim 51, further comprising connecting a second user to a second of said plurality of switches and sending control data from said second user to configure said second of said plurality of switches to define a second mode selected from the group consisting of star, trunk, ring, drop-add, broadcast, conferencing and monitor.

55. The method of claim 54, wherein said first mode and said second mode are simultaneously configured.

56. A method of hybrid in-band simultaneous out-band control, comprising providing a network; and using at least one method selected from the group consisting of drop-add of control data stream through the entire network and drop-insert of control data stream through the entire network.

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